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Further Development in the Assessment of Psychological Flexibility: A Shortened Committed Action Questionnaire (CAQ-8)

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What is already known about this topic?

- "Committed action," a component process of psychological flexibility, can be reliably and validly measures by self-report.
- This process is positively associated with emotional and social functioning and general health for people with chronic pain.

What does this study add?

- Here an 18-item measure of committed action is reduced to a more efficient eight-item measure.
- Analyses of the shorter measure show moderate to large correlations with measures of acceptance and patient functioning.

Abstract

Background: Committed action is a relatively understudied facet of the psychological flexibility model but a potentially important process of overt behavior in relation to chronic pain. In this study we take a previously developed measure of committed action, the Committed Action Questionnaire (CAQ), and validate a shorter version.

Methods: 664 adults seeking treatment for chronic pain participated in this study. They provided responses to the CAQ and also completed measures of acceptance and health-related daily functioning. Exploratory and confirmatory factor analyses as well as Mokken scaling analysis were used to explore the structure of the CAQ and produce an eight-item version (CAQ-8).

Results: A two-factor scale emerged from the analyses that both meets criteria for reliability and validity and performs comparably to the longer original version. In validity correlation analyses committed action as measures by the CAQ-8 was significantly associated with pain-related and general acceptance and with depression, physical and social functioning, mental health, vitality, and general health.

Conclusions: The CAQ-8 appears equally adequate as the CAQ as a measure of committed action. Its development ought to facilitate further study of this process of engagement in activity and of the wider psychological flexibility model in relation to chronic pain.

INTRODUCTION

The important role of psychosocial influences in chronic pain is now essentially established. Yet the work of expanding our understanding of chronic pain and developing better psychological treatments remains. As this work continues and models and theories evolve, our investigations ought to focus on more precise, and more generally applicable, processes of suffering, disability, behavior change, and recovery. One recent development in this regard is the psychological flexibility model (McCracken and Morley, 2014), including a specific therapeutic process called “committed action” (Hayes et al., 2012; McCracken, 2013). With new models and variables, such as these, comes the need to develop reliable and theoretically consistent measurement instruments that support their investigation.

Psychological flexibility is considered a basic quality of behavior (Hayes et al., 2012) and a fundamental aspect of healthy functioning (Kashdan and Rottenberg, 2010). It is defined as the capacity to persist with or change behavior, in a context of interacting psychological influences, in a way that serves one’s goals, and is consistent with what the situation at hand allows one to achieve (Hayes et al., 2006). There are now many studies of chronic pain and psychological flexibility, including its particular facets: acceptance, cognitive defusion, values-based action, present-focused awareness, self-as-observer, and committed action (for reviews see: McCracken and Morley, 2014; McCracken and Vowles, 2014).

Committed action is action that is guided by goals and values, is persistent, in that it can incorporate setbacks or discomfort and continue, and flexible, in that it can stop when it is unsuccessful. There are currently two studies that explicitly address committed action and chronic pain (McCracken, 2013; Trompetter et al., 2013). In one of these studies committed action was significantly associated with lower levels of depression and with better social functioning, mental health, vitality, and general health; separate from contributions to these health domains from measures of pain and acceptance of pain. In this study a measure of committed action, the 18-item Committed Action Questionnaire (CAQ), was introduced and preliminary reliability and validity were demonstrated (McCracken, 2013). Making the CAQ as

short as possible was not a goal of the original study. However, a shorter version of the CAQ could save patient time and effort and help researchers to get their data more efficiently, when needed.

The purpose of the current study is to further refine and shorten the CAQ. Factor analytic and non-parametric item response theory, Mokken scaling analysis (MSA), methods are applied to examine the dimensionality of the CAQ in a large sample of people seeking treatment for chronic pain. MSA is complimentary to and has several advantages over factor analytic methods, including determining whether the use of summed scores is appropriate (Emons et al., 2012). The aim here is to produce a short measure with essentially equivalent reliability and validity to the 18-item CAQ. Validity will be based on achievement of moderate sized correlations with measures of acceptance, and social and emotional functioning, and a small correlation with physical functioning, consistent with earlier studies.

METHODS

Sample

The study sample consisted of 674 consecutive adults with chronic pain referred to an interdisciplinary pain treatment unit in central London who attended either a four-week residential pain management course ($n = 500$), or a two-week residential course ($n = 174$), as part of the process of being considered for neuromodulation treatment. All data were gathered between January 2011 and November 2013. The sample here included the 216 participants (32% of the current total sample) from the original study in which the CAQ was first developed. The sample used in the analysis excluded 10 participants who did not complete the CAQ at their baseline assessment. Of these 664 participants, the mean age was 47.0 years (SD 11.8) and 414 (62%) were women. The majority were classed as being from a white ethnic group ($n=509$, 77%), followed by black ($n=89$, 13%), Asian ($n=37$, 6%), mixed ($n=23$, 3%), or Chinese and other ($n=6$, 1%). Median pain duration was 101 months (interquartile range from 54 to 196 months). The most frequently affected primary pain site was the lower back ($n=304$, 45.8%), followed by the

lower limbs (n=110, 16.6%), and generalised pain (n=93, 14.0%). Between 1% and 7% had a primary pain site involving the head/face, neck, should/upper limbs, abdominal, pelvic, or genital/anal regions. Just over a quarter of the sample were in employment (n=185, 28.0%). Of those not in employment (n=476, 72.0%), the vast majority reported that this was related to their pain (n=342, 71.8%).

All of the measures used in the current study were collected from participants on their first day of treatment, and their completion of these was supervised by trained clinical staff. All participants provided their permission for their data to be used in research and the project was granted ethics and Research and Development Department approval.

Measures

Committed Action Questionnaire (CAQ)

The CAQ is an 18-item measure derived from a pool of 24 original items that assesses committed action, a component process of the psychological flexibility model entailing flexible persistence in goal-directed behavior. The item pool includes thirteen positively phrased items (e.g. *"I can remain committed to my goals even when there are times that I fail to reach them"*) and eleven negatively phrased items (e.g. *"I find it difficult to carry on with an activity unless I experience that it is successful"*). Respondents are asked to rate the extent to which each of the items applies to them on a scale from 0, *"never true"*, to 6, *"always true"*. The development of the questionnaire is described in our earlier study (McCracken, 2013). In the original study, after the exclusion of six items, exploratory factor analysis revealed that the CAQ taps into two correlated factors relating to positive and negative aspects of committed action. The reliability of the total score was observed to be high (Cronbach's alpha .91), and correlation analysis revealed good convergent and divergent validity with other constructs – including pain acceptance, depression, and health-related functioning.

Acceptance and Action Questionnaire (AAQ-II)

The AAQ was developed as a way to assess the psychological processes included in Acceptance and Commitment Therapy (ACT: Hayes and Strosahl, 2004). It is regarded as a

measure of acceptance or experiential avoidance, depending on which way the items are scored. It is sometimes referred to as a measure of psychological flexibility. The original AAQ was revised and shortened to seven items, all of them negatively-keyed (Bond et al., 2011). Each item is rated on a seven-point scale from 1 to 7, “*never true*” to “*always true*.” Analyses of the AAQ-II show high internal consistency, good temporal stability, and good evidence for construct validity (Bond et al., 2011).

Chronic Pain Acceptance Questionnaire (CPAQ)

The CPAQ is a 20-item measure of pain acceptance (McCracken et al., 2004). It includes two factors, activity engagement and pain willingness (Vowles et al., 2008), although it is generally scored as a single construct. Each item is rated on a scale from 0 to 6, “*never true*” to “*always true*,” and higher scores reflect greater pain acceptance. The CPAQ has good demonstrated reliability and is well-validated (Vowles et al., 2008).

Patient Health Questionnaire (PHQ-9)

The PHQ-9 is a ten-item measure of depression (Kroenke et al., 2001). The first 9 items are scored on a 0 to 3 scale, from “*not at all*” to “*nearly every day*,” and reflect standard symptoms of depression. The last item is a rating of the degree of difficulties experienced by the symptoms endorsed, from not difficult at all to extremely difficult. The nine items are added together to produce a depression severity score. The PHQ-9 is widely used and well-validated.

The Short Form-36 Health Survey (SF-36)

The SF-36 is a 36-item measure of health and functioning designed for general use (Ware and Sherbourne, 1992; Ware et al., 1993). It considers eight primary aspects of health and functioning: physical functioning, role performance related to physical problems, bodily pain, emotional functioning (or mental health), role performance related to emotional problems, social functioning, vitality, and general health perception. A higher score suggests better health. The SF-36 is well-developed and widely used, and is considered more or less the “gold-standard” for self-report assessment of general health. In our analyses we focused on the scores for physical and social functioning, mental health, vitality, and general health.

Pain

Pain was assessed with a standard 0 to 10 rating scale with 0 meaning “*no pain*” and 10 meaning “*worst pain possible*” in the past week.

Statistical Analyses

Of the 664 participants with data available for analysis, 635 (96%) had no missing responses for any of the items. Missing item responses were imputed using a multiple imputation strategy, implemented using the programme *ice* in Stata 12.1 (Royston, 2007). Due to the very low frequency of missing responses for individual items (35 out of 11952, 0.3%) only a single imputed dataset was generated (Graham, 2009).

The data were randomly split into an exploratory sample ($n=333$), which was subjected to exploratory factor analysis (EFA) and exploratory MSA, and a confirmatory sample ($n=331$), which was subjected to confirmatory factor analysis (CFA) and confirmatory MSA. EFA used a maximum likelihood estimator applied to the item polychoric correlation matrix of the exploratory sample. The number of factors extracted was based on the Kaiser eigenvalues-greater-than-one criterion, inspection of the scree plot, and parallel analysis (Reise et al., 2000). Extracted factors were rotated using the oblique oblimin procedure to allow them to correlate. Based on the recommendation for short scales to contain between four and six items per factor (Yang et al., 2010), the four items with the highest loadings on each factor were selected for the short version of the questionnaire (were reliability and validity found to be inadequate at step 5 further items would have been added).

CFA was conducted using MPlus 7.1 (Muthén and Muthén, 2012) to test the fit of the shortened version of the measure in the confirmatory sample. Competing models were estimated using the robust weighted least squares method: one factor, two factor and bifactor. Assessment of goodness-of-fit was based on standard structural equation modelling criteria: root mean squared error of approximation (RMSEA) $<.08$, confirmatory fit index (CFI) $>.95$, and Tucker-Lewis index (TLI) $>.95$ (Hu and Bentler, 1999).

MSA was employed to further investigate the dimensionality of the questionnaire, and check the assumption of monotonicity in item responses (For detailed introductions refer to Sijtsma and Molenaar, 2002; Stochl et al., 2012; Watson et al., 2012). The key parameter is the scaling parameter H – where H_i is the scaling parameter for item i , and H_k is the scaling parameter summarizing the scalability of all items clustering onto scale k . Similar to the factor loading (and the discrimination parameter in standard IRT models), H_i indicates the strength of the relationship between the latent trait (e.g. committed action) and item i . That is, as the value of the latent trait increases so does the probability that a higher value of item i is rated. The following rules of thumb are used in interpreting H : $<.3$ = unscalable (i.e. no association between the latent trait and scores on the item/scale); $.3$ to $.4$ = weak; $.4$ to $.5$ = moderate; and $>.5$ = strong. A key assumption of MSA is that, for all items, a higher value of the latent trait is always related to a higher rating for the item. This is referred to as the monotone homogeneity assumption, and if met indicates that using a summed score for the items will result in the correct ordering of individuals on the latent trait.

Exploratory MSA used the *msp* programme in Stata 12.1 applied to the exploratory sample (Hardouin et al., 2011). This selects items in a stepwise manner by first selecting the pair of items with the highest combined H_k , and then sequentially adding the item that retains the highest value of H_k until H_k falls below a specified threshold. When this threshold is reached the procedure restarts, using the remaining items to form a separate scale. Confirmatory MSA used the *loevh* programme in Stata 12.1 applied to the confirmatory sample (Hardouin et al., 2011).

Reliability of the summed scores for the full and short CAQ versions was assessed by calculating Chronbach's alpha and Rho . The latter is based on the assumptions of MSA (Stochl et al., 2012). Validity was assessed by examining correlations between the scores from the shortened CAQ and measures of pain acceptance, general acceptance, and relevant health domains and by comparing the correlations of the full and short versions of the CAQ with these same variables.

RESULTS

Exploratory analysis

The item responses for the exploratory sample were subjected to EFA and exploratory MSA. In the EFA the Kaiser eigenvalues-greater-than-one criterion, inspection of the scree plot and parallel analysis all indicated a two factor solution, accounting for 53% of the variance between items. Oblique oblimin rotation revealed a pattern with positively phrased items loading on a factor explaining 71% of the common item variance, and negatively phrased items loading on a factor explaining 62% of the common item variance (Table 1). The correlation between the two factors was .57. Based the aim to produce a short version of the measure by including the items with the four highest factor loadings on each factor, items 4, 5, 7 and 8 were selected to the positively-keyed scale and items 12, 21, 22, and 23 were selected for the negatively-keyed scale (item numbers based on original pool of 24 items from McCracken, 2013).

Exploratory MSA indicated that the CAQ items clustered onto two scales, reflecting the positive and negative factors observed in the EFA. Setting no scalability threshold (i.e. $H_k=.0$) items clustered onto a single weak scale, with items 6, 11 and 14 omitted. Though the number of items omitted by the procedure differed, varying the threshold for the item scalability coefficient between .3, .4 and .5 all indicated two scales. The procedure setting the threshold to .4 retained at least 4 items on each scale and was selected as optimal (Table 1). One of the positive items (item 19) and three of the negative items were omitted by the procedure (items 6, 11, and 14). All of the items identified by the EFA for the shortened questionnaire were retained. The total scalability coefficient H_k for the positive and negative clusters indicated the items formed strong and moderate scales, respectively.

Confirmatory analysis

CFA and confirmatory MSA were applied to the eight items selected for the short version of the questionnaire in the confirmatory sample. Three competing CFA models were considered. A one factor model provided poor fit to the data (Chi-square(20)=39.2, $p<.001$; RMSEA= .239; CFI= .837; TLI = .883). A two-factor and bifactor model both provided acceptable fit to the data (Two factor: Chi-square(19)=33.1, $p=.020$; RMSEA= .050; CFI= .994; TLI = .996. Bifactor: Chi-

square(14)=22.3, $p=.052$; RMSEA= .046; CFI= .997; TLI = .994). Fit statistics were similar for the two factor and bifactor models, so there was no reason to select one as the 'optimal' model explaining the latent structure of the items. Taken together these two models suggest that while the latent structure of the items is multidimensional (capturing positive and negative aspects of committed action), a general construct exists underlying the item responses. This can be emphasized by observing that the bifactor model indicates that a general factor explains 62% of the common variance between items, with the positive factor uniquely explaining 24% and the negative factor uniquely explaining 14%. Parameter estimates for the two-factor and bifactor models are presented in Table 2.

Multi-dimensionality was further assessed by confirmatory MSA. Considering all items together as a unidimensional scale the scalability was moderate ($H_k=.47$). Scalability for positive and negative scales was observed to be .66 and .52, respectively, indicating that separately the positive and negative items formed strong scales. This supports the utility of separate positive and negative scores, but including an underlying general construct. For both positive and negative scales, examination of the assumptions concerning monotonicity of the item step response function and non-intersection of the characteristic curves within each item suggested they were met. This indicates that the use of the summed scores is appropriate – the level of the underlying latent trait increases as the summed score increases.

Reliability and validity

Reliability of the full and short versions of the CAQ was high when considering all items forming a unidimensional scale (i.e. total sum score) and also for separate positive and negative scales (Table 3). There was minimal loss of precision for the shortened version.

Correlations between the full and shortened CAQ with measures of acceptance and patient reported outcomes are shown in Table 4 (CFA sample). Unsurprisingly the total scores from the two versions of the CAQ correlated highly (.96), sharing 92% of variance. The effect sizes between both CAQ versions and the measures of acceptance and patient reported outcomes were the same in magnitude and direction, suggesting that the shortened CAQ reliably

measures the same construct as the full scale (i.e. good construct validity), with fewer items. The correlation results generally show that the CAQ, whether it is the original or shorter version, correlates as expected with measures of pain acceptance, general psychological acceptance, depression, social functioning, mental health, vitality, and general health. The original version failed to correlate with a measure of physical functioning, while the short version was able to obtain a significant correlation, although admittedly the correlation was small and minimally larger. Neither version correlated with pain, which is consistent with the results from the original study.

The eight-item version of the CAQ produced in these analyses (CAQ-8) is included in the Appendix to this article.

DISCUSSION

Psychometric analysis of the CAQ replicated the two factor solution observed previously (McCracken, 2013), and identified a shortened eight item version of the questionnaire without loss of reliability or validity compared to the full questionnaire. Since the MSA assumptions concerning monotonicity and non-intersection were met it is appropriate to use the summed scores on the all items. Of course, a shorter inventory has less content and potentially provides less information or detail about the underlying pattern of behavior being addressed. Nonetheless, the short eight-item version of this measure appears as psychometrically adequate as the original 18-item version.

The findings from the current study are consistent with the now very numerous studies showing that facets of psychological flexibility are significantly related to important domains of daily functioning for people with chronic pain (McCracken and Morley, 2014). They broaden these earlier findings by showing that committed action, one of the least investigated facets of psychological flexibility, may be an important one. As such the results here are consistent with the earlier findings from the two other studies known to have addressed this topic (McCracken, 2013; Trompetter et al., 2013). Before these few studies appeared committed action was only conceptually important within the psychological flexibility model and was already incorporated in

treatments based on it, including ACT. Now there are increasing data that begin to support its theoretical role and application.

In the first study published on the CAQ a point was made that the role of activity patterns in chronic pain appears murky and even contradictory, with questions regarding what is best to do: avoid, persist, or pace oneself (McCracken and Samuel, 2007). One of the problems with these behavior patterns is that they are defined by form (i.e., what they look like) more than by function (i.e., the results they produce). Each of these is a predominant way to structure activity but they are not functionally defined or dynamic. If anything, functionally speaking, they also maintain a link with pain as a key influence, even if this is implicit or ironic. Patterns of activity that include “avoid *pain*,” “persist despite your *pain*,” and “pace within the range of *pain* you are willing to experience,” are all largely pain-determined behavior patterns, and largely negatively reinforced. They do not include goals and values as predominant guiding influences, nor do they adequately include positive motivation and reinforcing elements as initiators and maintainers of behavior patterns, such as those one might try to produce in psychological treatments. This confusion around activity management methods is similarly reflected in a recent content analysis of measures of “pacing” (Nielson et al., 2014). The conclusion of this analysis was that a link between these measures and clear theory is weak and distinctions in the purposes of pacing, such as conserving energy versus increasing activity tolerance, also are unclear.

With a growing number of choices of validated instruments for processes related to committed action, it appears a fortuitous time for further investigation of these processes. Perhaps for too long studies have focused too much on acceptance and mindfulness (McCracken and Samuel, 2007), and more recently on cognitive processes of psychological flexibility (McCracken et al., 2013). Within psychological flexibility these processes fit within a focus on openness and awareness (Hayes et al., 2011) but they do not reflect the full model. The other side of the model includes the motivation, engagement, or activation facets, such as those reflected in a focus on values (McCracken and Vowles, 2008; McCracken and Yang, 2006), and committed action, as studied here. This latter set of processes may be important if

we are to ensure that treatment developments do not only achieve process like “dropping the struggle” and “coming to one’s sense,” and outcomes such as decreased depression and anxiety; but that we also include processes like goal-directed action and improved engagement in life’s physical activities, social roles, and leisure pursuits (McCracken and Vowles, 2014).

In practice, the CAQ-8 total score or the positive and negative sub scale scores may be used. The total score represents an individual's general propensity to persist in goal-directed behavior, capturing both positive and negative aspects of the construct. Bifactor modelling indicated the general factor accounted for almost two-thirds of the common variance between items. This approach allows the separation of variance into components related to a general factor, group factors and unique variance. It is increasingly being used to examine whether multidimensional can be considered sufficiently unidimensional to allow for the use of a total score (Chilcot et al., 2011; Norton et al., 2013; Reise et al., 2007). Some caution needs to be taken when using the positive and negative subscales separately due to the level of saturation in these scores from the general factor. As a result, the correlation between positive and negative scale scores is relatively high ($r=.55$). This poses an issue with discriminant validity for the two subscales, which may, for example, cause problems with colinearity when attempting to use both variables as a predictor in a regression model. **We advise that the single total score be used most of the time, as the total is theoretically complete, and more parsimonious.**

When interpreting the current findings, a few limitations are worth noting. Although the sample here is more than twice as large as the original study of the CAQ, it remains the same population and a selected proportion of all those with chronic pain, and even of all those who seek treatment. **First**, the generality of the findings here remain to be investigated. Whether the same results in producing the CAQ-8 would have emerged in other populations is not clear, further cross-validation is needed. As well as claims about the psychometric qualities of CAQ-8 we believe it is legitimate to interpret substantive findings regarding committed action that have emerged here too, particularly as there are now two studies that yield essentially the same results. However, both the findings that support the properties of the instruments and the

substantive findings deserve further testing. Second, in shortening the CAQ item content is lost. Hence, necessarily, the construct being assessed is less comprehensively sampled and some degree of content validity may be lost. However, the intercorrelation of the CAQ and CAQ-8 is very high ($r=.96$) and the pattern of correlations of the two versions with other measures of acceptance and patient functioning provide no evidence for loss of construct validity in the shorter form. So, this apparent threat to content validity may be insignificant. Third, the definition of committed action we apply here may seem somewhat narrow. There are no doubt other important patterns of behavior change that are not included, such as behavior change that meets no difficulties, or the integration of initial behavior change into broad and generalized patterns of behavior. Future research may address these issues. Finally, as with any study that is not an experiment or controlled treatment outcome study, these results do not support inferences regarding causal relations between committed action, as a potential therapeutic process, and outcomes, in terms of health status and functioning.

We have shown that a previously designed measure of committed action can be shortened and retain strong construct validity and reliability. Accordingly, we conclude that the CAQ-8 seems as adequate as the full CAQ and recommend its use in future studies. Further, these analyses continue the introduction of a possibly different and integrative way to look at patterns of activity in relation to chronic pain, one that can make sense of the confusion and contradiction in current approaches, one that is functional, flexible, motivationally sensitive, goal-directed, and clearly based in a theoretical model.

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AUTHOR CONTRIBUTIONS

LM conceived the study and acquired the data. JC and SN conducted the analysis. All authors contributed to the interpretation of the data and were involved in drafting and revising the article.

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Tables and Appendix

Table 1. Results of the exploratory analysis (exploratory sample, $n=333$)

Table 2. Confirmatory results (confirmatory sample, $n=331$)

Table 3. Reliability (confirmatory sample, $n=331$)

Table 4. Validity for Committed Action Question – 8 item (CPAQ-8) (confirmatory sample, $n=331$)

Appendix: Committed Action Questionnaire (CAQ-8)